Open Architecture

An Enterprise Approach to Introducing Open Architectures Into Navy Combat Systems… and Beyond

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Why Open Architecture

Business

- Today's In-Service Computing Architectures are Unaffordable
- Each Ship Class Addressing the Problem Uniquely
- Fact of Life Replacement of Obsolete Hardware
- Commercial Market

Technical

- Current Computing Architectures Limit Capability Increases
  - Current Surface Ship Computing Systems Have Been at Performance Capacity for Years
- Warfighting Concepts to Warfighting Capability Takes 5 Years to IOC
- Computer Throughput and Speed Requirements Dictate use of Commercial Computing Technologies and Modern Software Languages

Improved Warfighting Capability Depends on Open Architecture

How Did We Get Here?

1990's

- Proliferating Surface Ship Combat System Baselines
- Upgrade Costs Measured in the 100's Millions
- Shared Memory Computer Architectures Prevent Combat System Enhancements
- No Navy Wide nor Joint Focused Coordination of Warfare System Development

2000-2002

- Unique Warfare System Development Continues
  - Surface
  - Submarine
  - Air
- COTS Introduction Challenging and Increasingly Expensive
- COTS Real-Time Computing and Switching Matures

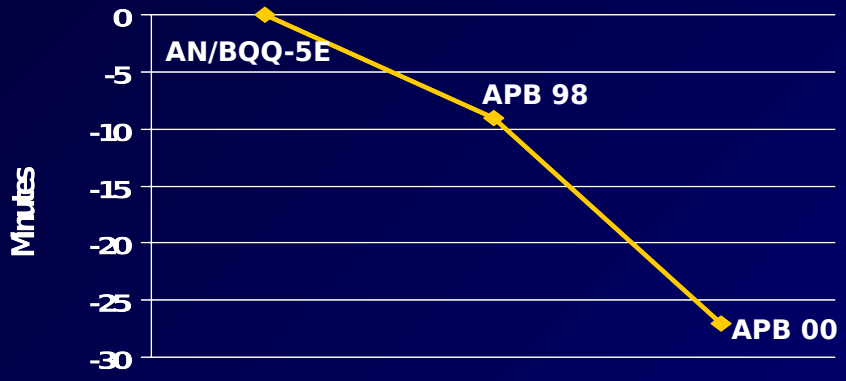
2003

- Interim Navy Documentation of OA Technical and Architectural Requirements Released
- Embraced 'ARCI-Like' Process to Facilitate OA Introduction in Surface Combat Systems
- Re-Aligned DD(X) Technical Architecture to OA
- Teamed With SIAP for TM
- Initiated CG 47 / DDG 51 / SSDS Plan to "OPEN" Warfare Elements
- LCS RFP calls for OA Technical Architecture
- OA EXCOMM: Air and Submarine Communities to Join for an Enterprise Approach

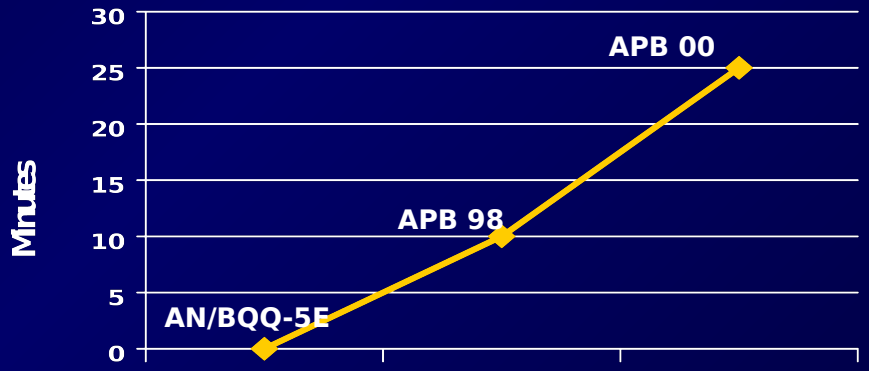
to Submarine Acoustic Systems

Improved Detection, Classification Rate, and Longer Holding Time

Mean Time to Detection and Classification

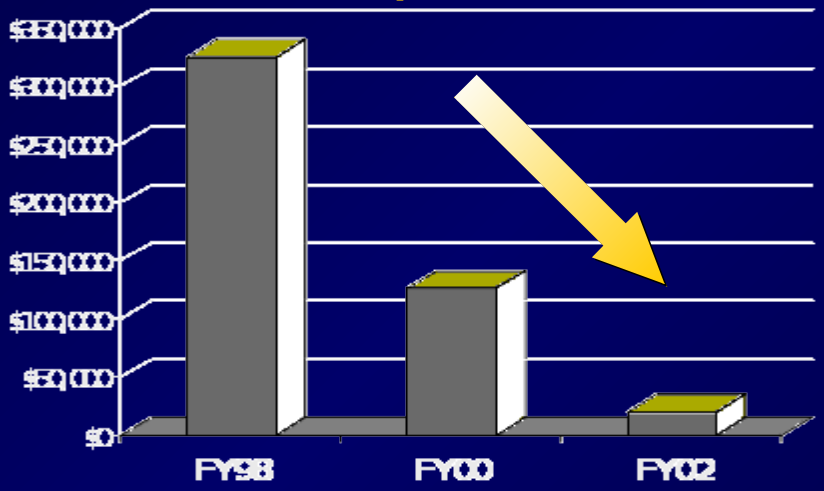


Mean Time of Holding after Detectio

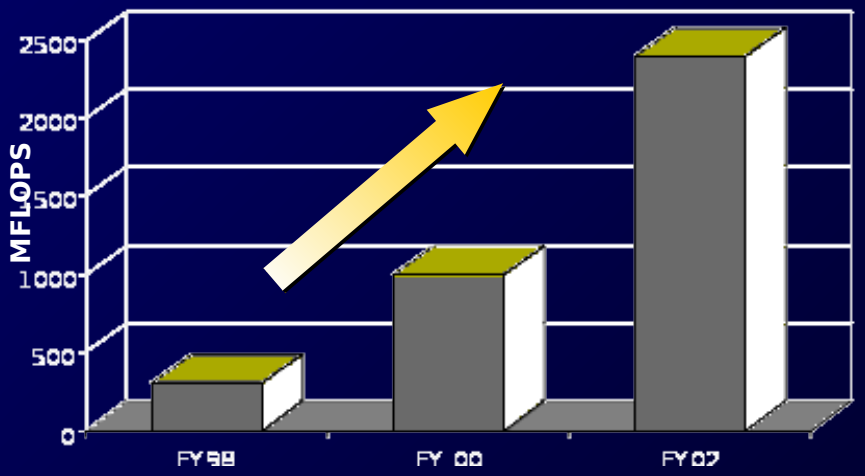


More Processing Power at Lower Cost

Development Costs



Processing Power



The Underlying Concept of OA

Surface Combatant Ship System

POSIX, CORBA, etc. | TM, NAV, ID, etc.

Standards Based Computing Environment | Common Functions | Surface Combatant Ship Unique Functions | SCS System Unique & Common Applications & Interface

Aircraft System

POSIX, CORBA, etc. | TM, NAV, ID, etc.

Standards Based Computing Environment | Common Functions | Aircraft Unique Functions | ACFT System Unique & Common Applications & Interface

CVN Ship System

POSIX, CORBA, etc. | TM, NAV, ID, etc.

Standards Based Computing Environment | Common Functions | CVN Unique Functions | CV System Unique & Common Applications & Interface

Submarine System

POSIX, CORBA, etc. | TM, NAV, ID, etc.

Standards Based Computing Environment | Common Functions | Submarine Unique Functions | Submarine System Unique & Common Applications & Interface

Open Architecture

= Common Computing Environment + Common Platform Functions + Platform Unique Functions = **Interoperable System of Systems**

Common Architecture

Open Computing System Definition

A System That Implements Sufficient Open Specifications for Interfaces, Services, and Supporting Formats to Enable Properly Engineered Components to be Utilized Across a Wide Range of Systems With Minimal Changes, to Interoperate With Other Components on Local and Remote Systems, and to Interact With Users in a Style That Facilitates Portability.

Key Open Computation System Characteristics:

- **Based on Open, Publicly Available Specifications — Preferably Maintained as Standards by a Internationally Recognized Governing Group**
- **Well-Defined, Widely Used Non-Proprietary (Std) Interfaces, Services and Formats**
- **Durable Component Interfaces That Facilitate Component Replacement**
- **Upgradeable Through Incorporation of Additional or More Capable Components With Minimal Impact on the System**

— Open Systems Joint Task Force

Open Architecture

What is it?

- ***A Navy Wide Technical Architecture…*** **Computing Environment Based on International Standards**
- ***A Navy Wide Functional Architecture…*** **Standardization of Common Components and Critical Interfaces**
- ***Common and Reusable Software Applications…*** **Across Platforms in the Joint Net Centric**

What Does it Mean…

Operationally

- ✓ **Provides Joint Interoperability**
- ✓ **Enables Sea Power 21 and FORCEnet**
- ✓ **Increased Capabilities and Performance**

Programmatically

- ✓ **Faster "Time to Market"**
- ✓ **Facilitates COTS Refresh / Technology Insertions**
- ✓ **Broader Industrial Base**

Affordability

- ✓ **Common Software Development and Maintenance Efforts**
- ✓ **Avoids Costs for Testing / Certification**

Understanding OA

OA Will Not Result in…

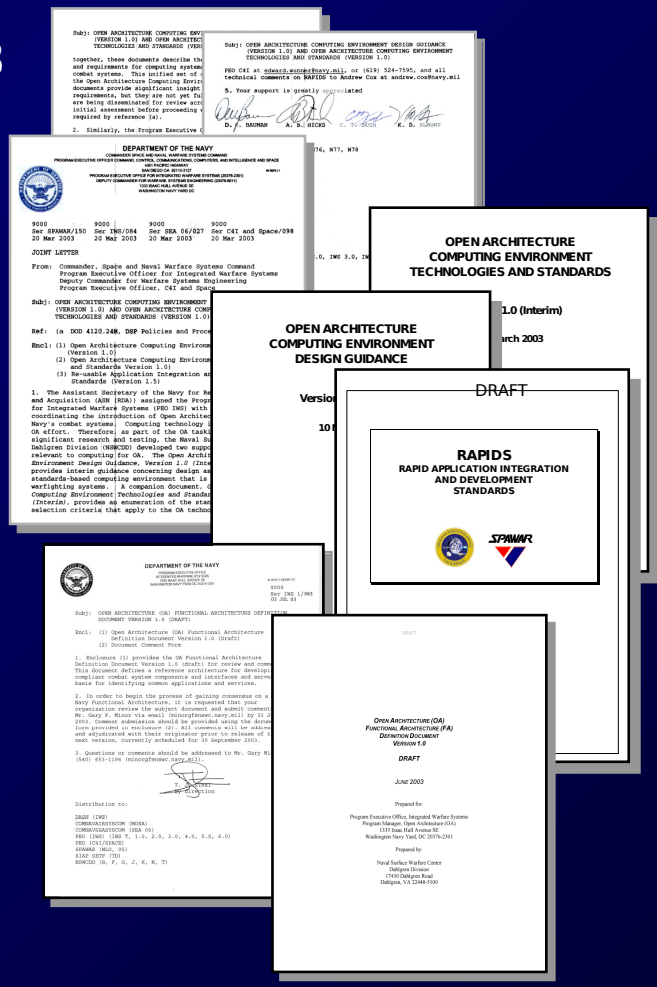
- A Single Set of Computing Equipment for All Platforms
- A Single Set of Computer Programs for All Platforms

OA Will Result in…

- A Common, Navy Wide Technical and Functional Architecture Extensible to the Joint Environment
- Maximum Use of International Standards Based Hardware and Software
- Maximum Reuse of Warfighting Applications and Common Service Applications
- Rapid & Affordable Modernization and Life Cycle Support

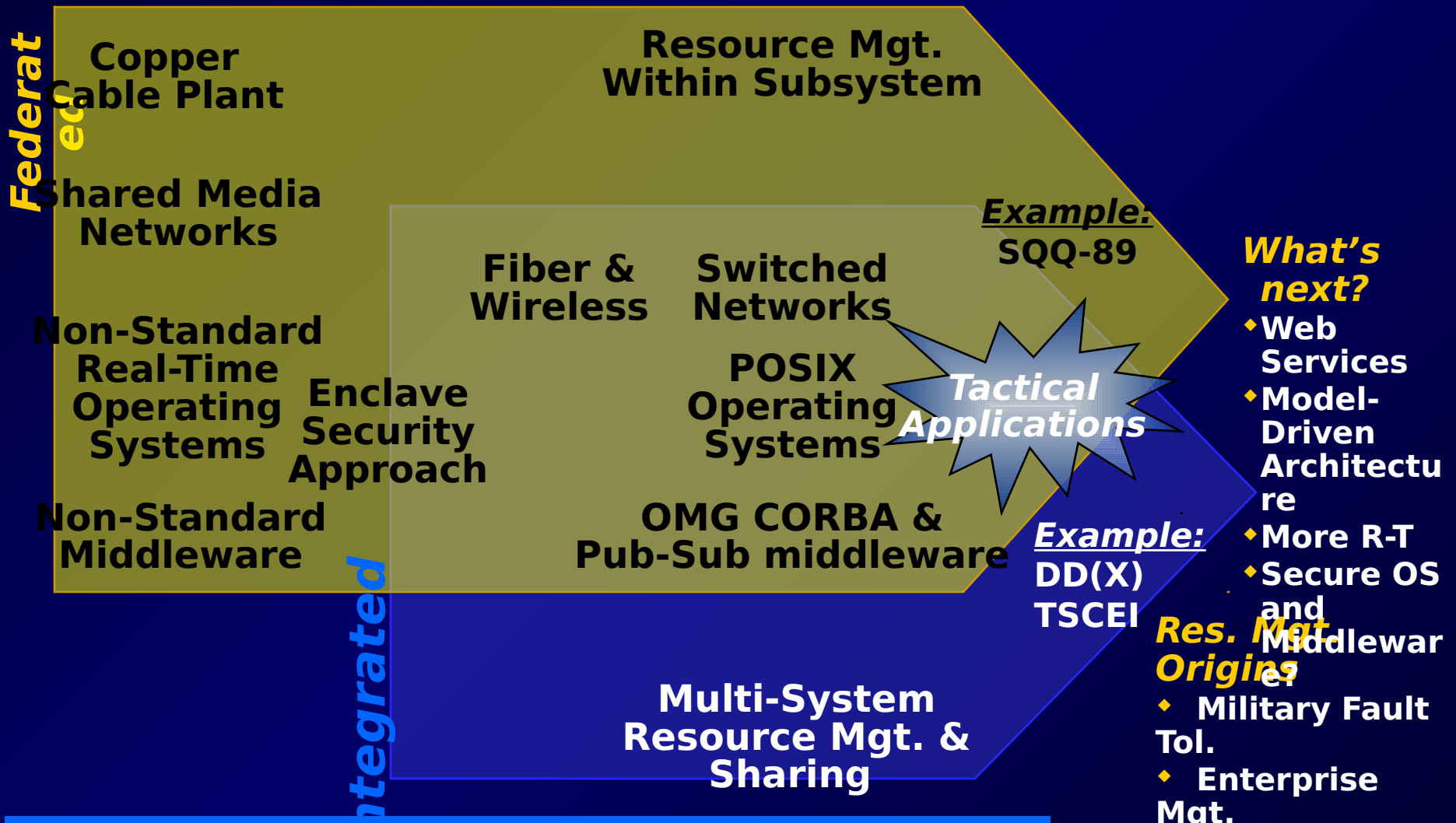
OA Standards and Design Guidance

- OA Standards and Guidance Document (Interim) and RAPIDS Released in March 2003
  - Signatories: PEO IWS, PEO C4I and Space, NAVSEA and SPAWAR
- OA Functional Architecture Document (Interim)
  Released July 2003
- Some 2000 Comments Received and Adjudicated
  - Documents Released to VIEWnet Fall of 2003
- OA EXCOMM
  - Pursue Enterprise Approach
  - Use Virtual SYSCOM: NAVSEA, NAVAIR and SPAWAR
- Developed Overview Volume 0 and Revised Volumes 1-3
- Scheduled to Present to VSC Level I on 18 Feb
- [illegible]

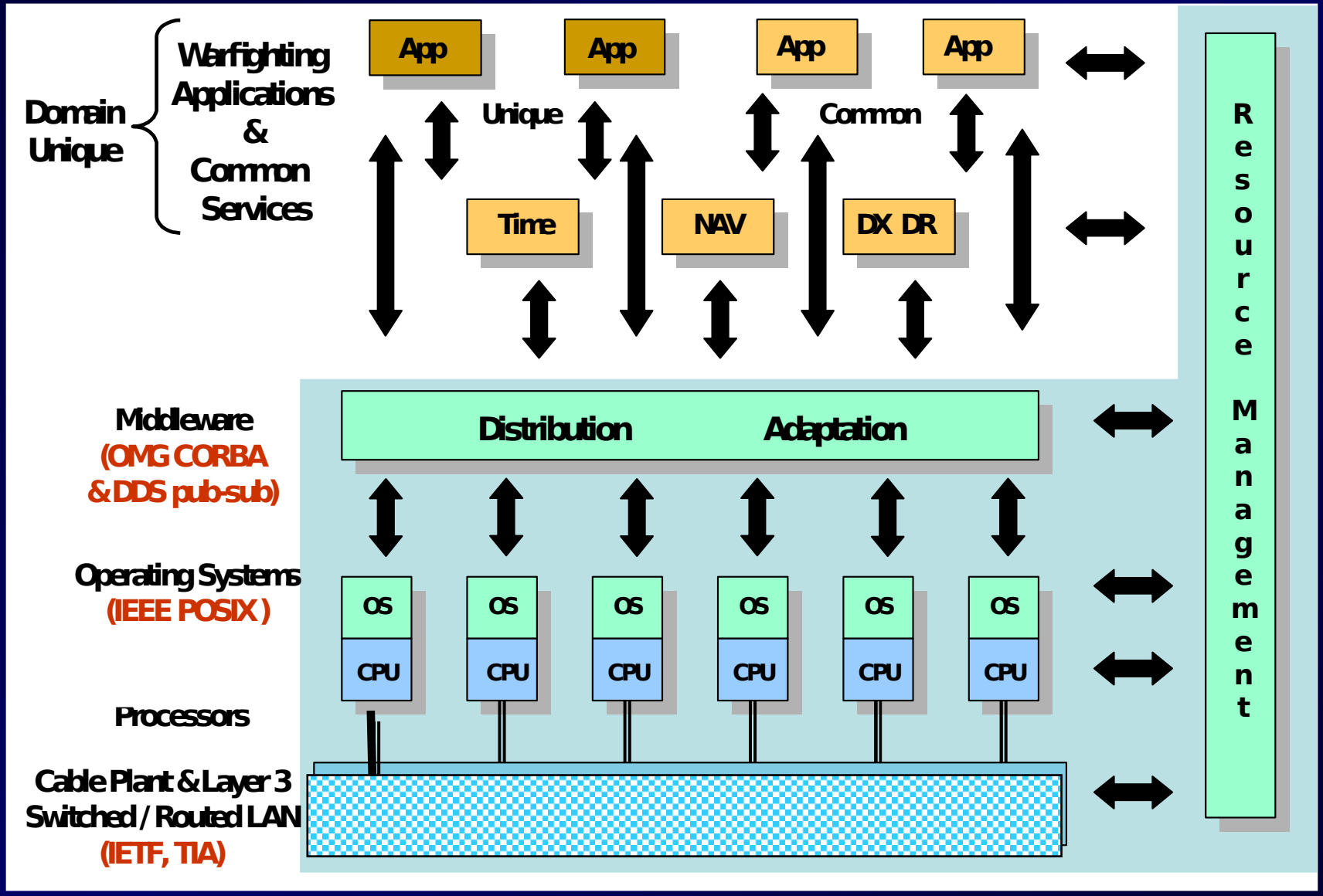


FORCEnet Compliance Dictates Compliance With OA Documentation

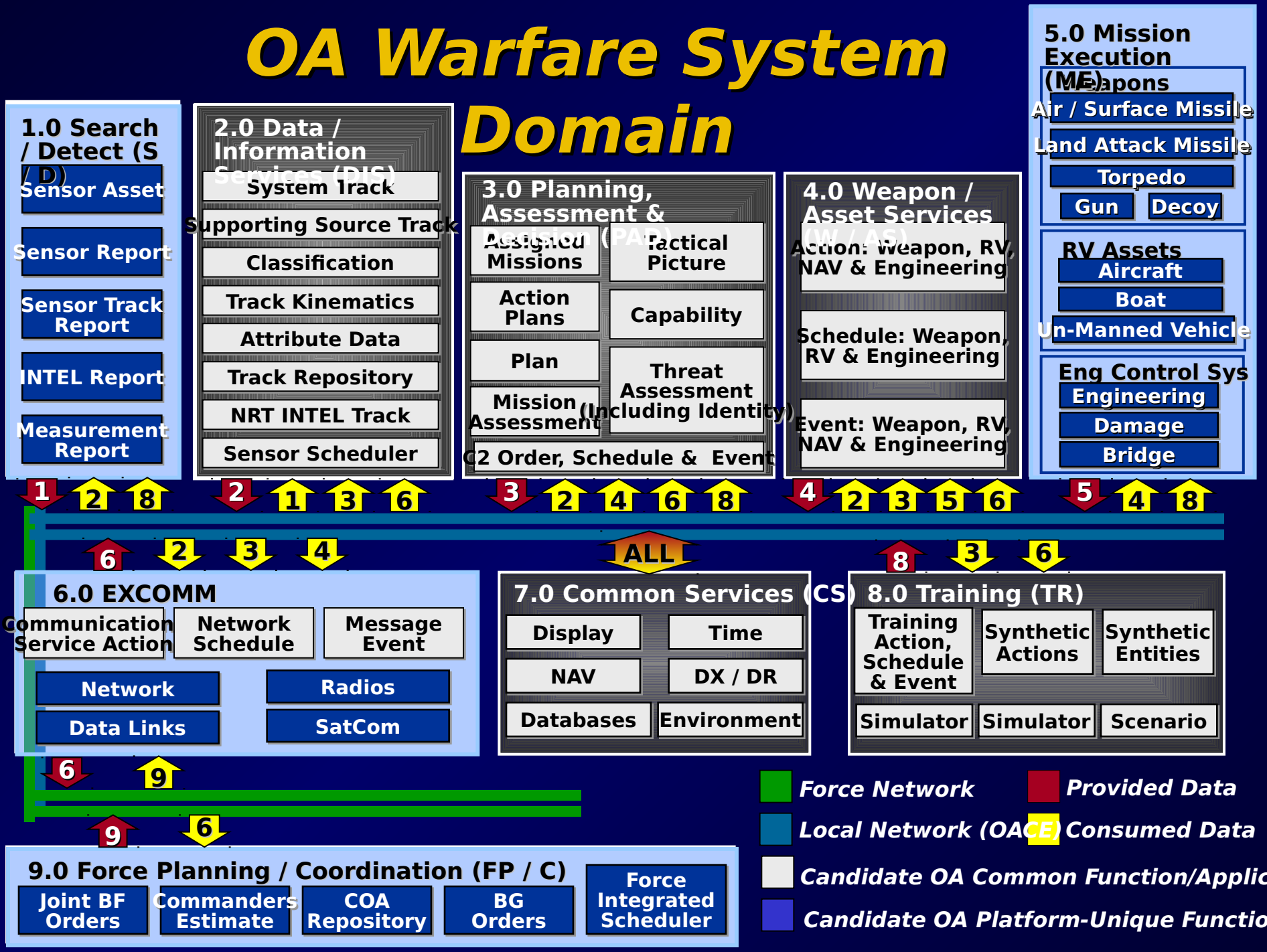
Computing Technology Base



OA Technical Architecture



OA Warfare System Domain



OA Strategy

OPEN ARCHITECTURE

Modernization and New Construction

Legacy Systems

Re-Useable Applications & Common Services

Category 5
Total Ship Computing Systems

- ✓ *Computational Services Provided by Platform*
- ✓ *Significant Automation & Reduced Manning*
- ✓ *Enhanced Survivability & Warfighting*

+

Required for

Category 4
OA "Common Function" Systems

- ✓ *Common Warfighting Applications*
- ✓ *Common Services*
- ✓ *Rapid & Affordable Upgrades*

+

Selected Systems

Category 3
OACE Standards Based Systems

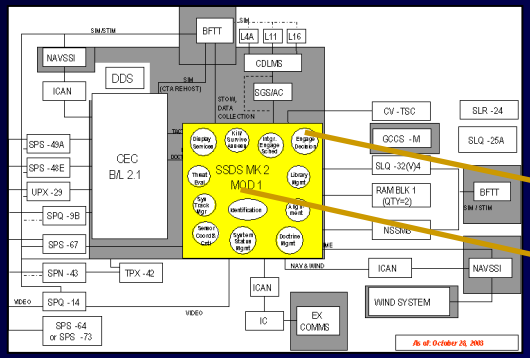
- ✓ *Decouples Software & Hardware*
- ✓ *Enables Unconstrained Computing Growth*
- ✓ *Provides Inherent Performance Improvements*
- ✓ *Enables Common Functions*

Categories 1 & 2
Current Systems

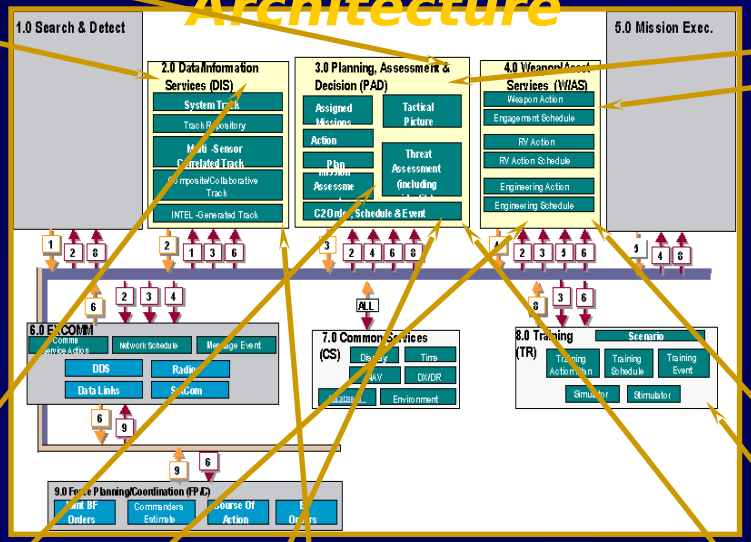
Interfaced to OA Conformant Systems

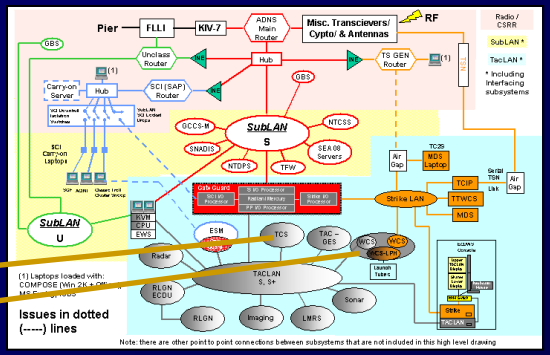
No Future Upgrades

OA Development



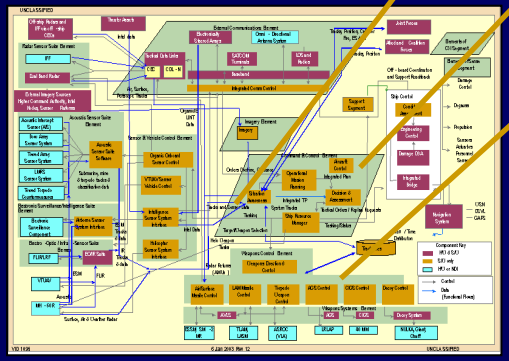
SSDS



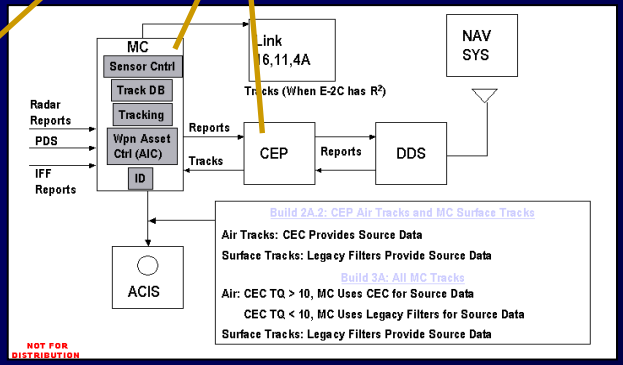


Subs

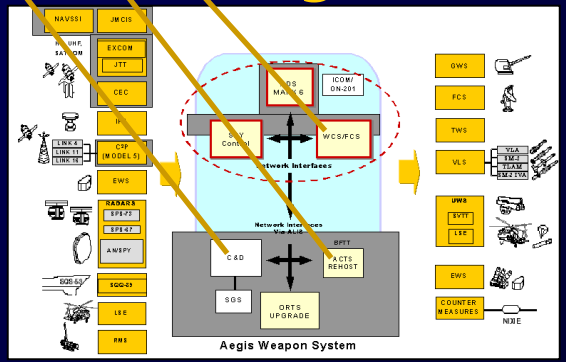
DD(X)



E-2C



Aegis



OA Fielding Strategy

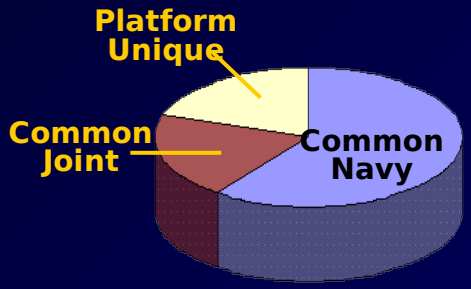
Step IV — FY 10 and Beyond: ***Fleet-wide Introduction of CATEGORY 4 / 5 Compliant***

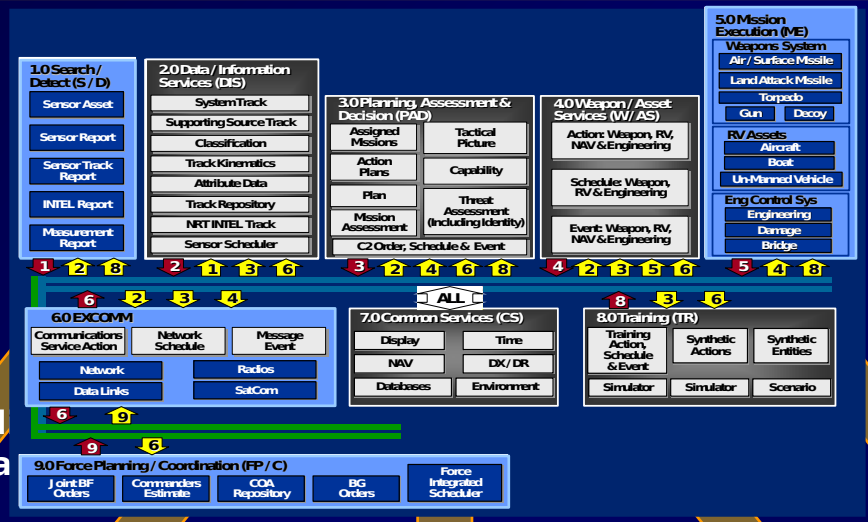
Step III — FY 05 - 10: ***Develop CATEGORY 4 / 5 Software Applications Combat Systems***

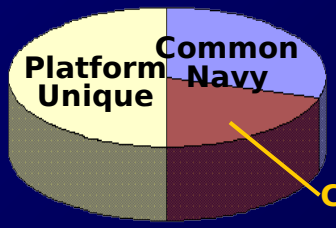
Step II — FY 04 - 08: ***Equip LCS, Aegis, CVs, and Amphibs with CATEGORY 3 Capability ...OA services + Apps***

Step I — FY 03 - 05: ***Define and Pursue OA Technical and Functional Architecture for Surface, Air, Submarines***

Navy OA Enterprise Architecture







CVN / L-Class Specific:

- Sensor / Weapons Suite
- Mission-Unique Functional
- Mission-Unique HMI Displa

E2 Specific:

- Sensor / Weapons Sui
- Mission-Unique Funct
- Mission-Unique HMI D
- Aircraft Avionics